

REMARKS

Claims 1-11, 13-41, 81-114, and 116-119 are currently pending in the case. Further examination and reconsideration of the presently claimed application are respectfully requested.

Section 103 Rejections:

Claims 1-11, 13-41, 81-114, and 116-119 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,222,624 to Yonezawa (hereinafter "Yonezawa") in view of U.S. Patent No. 5,274,434 to Morioka et al. (hereinafter "Morioka"), U.S. Patent No. 5,585,916 to Miura et al. (hereinafter "Miura"), U.S. Patent No. 6,496,256 to Eytan et al. (hereinafter "Eytan"), and U.S. Patent No. 6,259,108 to Antonelli et al. (hereinafter "Antonelli"). As will be set forth in more detail below, the §103(a) rejections of claims 1-11, 13-41, 81-114, and 116-119 are respectfully traversed.

To establish *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP 2143.03. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond*, 910 F. 2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). The cited art does not teach or suggest all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

The cited art does not teach or suggest a contact image sensor configured to acquire images of repeatable pattern features on a wafer without contacting the wafer. Independent claim 1 recites in part: "wherein the specimen comprises a wafer having repeatable pattern features, and wherein the contact image sensor is further configured to acquire images of the repeatable pattern features and the wafer without contacting the wafer." Independent claims 41, 81, 82, 86-88, 109, 114, and 118 recite similar limitations.

The Office Action states that "Yonezawa shows that it is known in the art to inspect wafers (8; column 6, line 42) having repeatable patterns thereon (abstract, line 4) by obtaining images of the patterns on the wafer." (Office Action -- page 2). Although Yonezawa teaches obtaining images of the patterns on a wafer, Yonezawa does not suggest or provide motivation for obtaining images of the patterns on a wafer

using a contact image sensor. For example, Yonezawa teaches an optical system for forming images of a wafer that is substantially different from a contact image sensor. In particular, Yonezawa states that "an optical system for bright field observation, which includes:...a collimator lens 6 having a diameter larger than that of a wafer 8 which is an object to be inspected." (Yonezawa -- col. 6, lines 36-43.) Therefore, the optical system of Yonezawa is substantially different in structure from a contact image sensor, and therefore, one of ordinary skill in the art would expect the system of Yonezawa to have completely different performance capabilities than a contact image sensor. As such, Yonezawa cannot suggest forming images of a wafer with a contact image sensor.

The Office Action also states that "As shown by Morioka et al, it is known in the art that images can be obtained from a patterned wafer (111) using such a sensor comprising an array of lenses (503) and a detector array (505)." (Office Action -- page 2.) However, even if the optical subsystem of Morioka can be considered to be a contact image sensor (e.g., Morioka only teaches that the optical system may include a lens array that has been used for facsimiles, electronic copying machines and so forth (Morioka -- col. 16, lines 54-58)), Morioka does not teach that such a sensor is capable of forming images of patterned features on a wafer. Instead, Morioka simply acknowledges that light reflected from patterned structures on a wafer will be detected by the sensor thereby creating noise that will interfere with particle detection. However, Morioka does not teach that the diffracted light from repetition patterns on the wafers can be imaged by the sensor or can be used to form an image of the repetition patterns. In particular, Morioka does not teach that the prior art system has sufficient resolution to image repeating patterned features on a wafer.

The Office Action also states that "[Morioka] adds to the teaching of the art that the system can usefully obtain images (filtered by the Fourier filters, but images none the less) in the context of, and with sufficient resolution for, testing patterned wafers." (Office Action -- pages 2-3.) Applicants respectfully disagree. For example, Morioka does not teach or suggest acquiring images of repeatable pattern features on a wafer as presently claimed. In particular, Morioka teaches that the system includes "a detector for detecting the imaged optical signal" (Morioka -- col. 3, line 7) after the light passes through "a spatial filter so disposed as to cut off or block a diffraction light from repetition patterns on the wafers" (emphasis added, Morioka -- col. 3, lines 4-5). Therefore, Morioka does not teach that patterned features on the wafer are imaged by the system particularly since the light from the patterned features is blocked. Instead, only areas surrounding patterned features will be imaged.

In addition, Morioka teaches that the prior art system is designed to image foreign particles that are present on the wafer. As is known to one of ordinary skill in the art, foreign particles have much larger dimensions than repetition patterns on a wafer. Therefore, systems that are designed to image patterned features on a wafer will need to have a much higher resolution than systems such as those taught by Morioka which are only designed to image foreign particles on a wafer. As such, although Morioka teaches that the system has sufficient resolution to image foreign particles, Morioka does not teach or suggest that the system has sufficient resolution to image repetition patterns of a wafer. In addition, as is known to one of ordinary skill in the art, optical systems that have such dramatically different resolution requirements will normally differ significantly in optical configuration.

Moreover, it is known to one of ordinary skill in the art that optical systems must be altered when imaging objects having different properties. For example, Antonelli teaches that a standard CIS that is used for document scanning must be altered in order to produce images of a fingerprint (Antonelli -- col. 4, lines 41-51). As such, although Morioka teaches that the system can image foreign particles, Morioka does not teach or suggest that the sensor can be used to image the repetition patterns on the wafer. Therefore, for at least the reasons provided above, it would not be obvious to one of ordinary skill in the art to use the system of Morioka to attempt to image patterned features on a wafer since the prior art does not suggest a reasonable expectation of success in doing so. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). MPEP 2143.02.

Furthermore, even if the system of Morioka can be modified to image patterned features on a wafer, the cited art does not provide any suggestion or motivation for doing so. For example, Morioka appears to teach away from such a modification. In particular, Morioka states that "A method of eliminating the repetition patterns and detecting defects is known conventionally, and this method can reliably secure detection performance." (Morioka -- col. 3, lines 65-68.) Therefore, Morioka teaches that eliminating light diffracted from the repetition patterns in the images produced by the system (thereby not imaging the repetition patterns) provides reliably secure detection performance. As such, Morioka teaches away from modifying the system of Morioka such that the system can image such repetition patterns. A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). MPEP 2141.02.

Morioka also states that "the present invention must use the spatial filter." (emphasis added, Morioka -- col. 16, lines 60-61.) More particularly, Morioka states that "The present invention achieves a compact foreign particle monitor using the refractive index changeable type lens array on the basis of this concept that the spatial filter can be used for the refractive index changeable type lens array." (Morioka -- col. 16, lines 64-68.) Morioka also states that "Having the construction as described above [including the spatial filter], the present invention can execute the foreign particle inspection in the mass production line of the semiconductor fabrication process on the real time basis, can minimize the defective products and can greatly contribute to the improvement in the yield of the product." (Morioka -- col. 17, lines 25-30.) Furthermore, Morioka states that "The present invention has principal objects of providing methods and apparatuses for foreign particles or particles real time inspection in mass production lines." (Morioka -- col. 2, lines 35-37.) Therefore, Morioka teaches that the construction of the optical system, including the spatial filter which removes diffraction light from repetition patterns on a wafer from the light that is imaged, enables the prior art invention to meet its principal objects (e.g., a compact foreign particle monitor, real time inspection, etc.). In this manner, the teachings of Morioka suggest that modifying the system of Morioka such that the repetition patterns can be imaged would render the prior art invention of Morioka unsatisfactory for its intended purpose. Consequently, there is no suggestion or motivation to modify the system of Morioka as suggested in the Office Action. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), MPEP 2143.01.

Antonelli does teach a contact image sensor. However, Antonelli teaches a contact image sensor that can image a fingerprint by contacting the fingerprint. For example, Antonelli states that "A narrow strip of the fingerprint touching a transparent platen is illuminated by sheet of collimated light at an oblique angle to the surface." (Antonelli -- abstract.) Although Antonelli teaches a contact image sensor, Antonelli does not teach that the contact image sensor can be used to create images of patterned features on a wafer. In addition, as is known to one of ordinary skill in the art, fingerprints have much larger dimensions than patterned features on a wafer. Therefore, systems that are designed to image patterned features on a wafer will need to have much higher resolution than systems such as those taught by Antonelli which are designed to image fingerprints. Therefore, although Antonelli teaches that the prior art system has sufficient resolution to image fingerprints, Antonelli does not teach or suggest that the prior art system has sufficient resolution to image patterned features of a wafer. In addition, as is known to one

of ordinary skill in the art, optical systems that have such dramatically different resolution requirements will normally differ significantly in optical configuration.

The Office Action states that "Antonelli et al characterized such a system as providing 'high resolution' (column 2, line 55)." (Office Action -- page 3.) The portion of Antonelli to which the Office Action makes reference, however, is consistent with all other portions of Antonelli in that it contains teachings with reference specifically to imaging fingerprints. In particular, Antonelli states that "The advantages of this arrangement are that a very compact optical system can be achieved which provides fingerprint images which have low distortion, high resolution and large format size." (emphasis added, Antonelli -- col. 2, lines 52-55.) Therefore, although Antonelli teaches that fingerprints can be imaged with high resolution, it will be obvious to one of ordinary skill in the art that the teachings of Antonelli do not suggest that high resolution of patterned features on a wafer can be obtained with the prior art system.

In addition, it is known to one of ordinary skill in the art that optical system configurations must be altered when imaging objects having different properties. For example, Antonelli teaches that a standard CIS that is used for document scanning must be altered in order to produce images of a fingerprint that have suitable contrast (Antonelli -- col. 4, lines 41-51). As such, although Antonelli teaches that the prior art system can image fingerprints, Antonelli does not teach that the prior art sensor can be used to image repetition patterns on the wafer. Therefore, it would not be obvious to one of ordinary skill in the art to use the system of Antonelli to attempt to image patterned features on a wafer particularly since the prior art does not suggest a reasonable expectation of success in doing so. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). MPEP 2143.02.

Furthermore, even if system of Antonelli can be modified to image patterned features on a wafer, the cited art does not provide any suggestion or motivation for doing so. For example, Antonelli appears to teach away from such a modification. In particular, Antonelli states that "A finger with fingerprint 5 is wiped over the top of the sensor platen to obtain a fingerprint image." (Antonelli -- col. 5, lines 23-24.) Antonelli also states that "The top of platen 1 has a slightly raised strip 1b which provides increased pressure of the fingerprint on the platen, improving image quality by causing the skin to contact the platen more firmly." (Antonelli -- col. 5, lines 40-43.) Therefore, Antonelli teaches that forming images of a fingerprint with good image quality are obtained by increasing the pressure of the fingerprint on the sensor. However, as is known to one of ordinary skill in the art, contact between a wafer and a sensor is highly

undesirable and may destroy the wafer or patterned features on the wafer. Therefore, if the system of Antonelli is used to inspect wafers, it must be designed to do so without contacting the wafer. However, Antonelli teaches away from modifying the prior art system such that images can be formed without contacting the specimen being imaged since Antonelli teaches that reducing or eliminating contact between the sensor and the specimen will reduce image quality. A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). MPEP 2141.02.

In addition, since Antonelli teaches that images of a fingerprint are formed by contacting a fingerprint with a sensor and the image quality of the fingerprint images can be improved by increasing the pressure of the finger on the sensor platen, the teachings of Antonelli suggest that modifying the operation of the system of Antonelli such that the specimen to be imaged does not contact the sensor would render the prior art invention of Antonelli unsatisfactory for its intended purpose of fingerprint imaging. Consequently, there is no suggestion or motivation to modify the system of Antonelli as suggested in the Office Action. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). MPEP 2143.01.

The Office Action states that "That Antonelli et al uses the system to image a fingerprint pattern does not teach or suggest that such a systems are limited to detection of fingerprint patterns." (Office Action -- page 5.) For at least the reasons set forth above, however, the teachings of Antonelli do not teach, suggest, or provide motivation for using the systems of Antonelli to image patterned features on a wafer. More particularly, even if the systems of Antonelli can be used to inspect patterns other than those of fingerprints, the prior art does not teach or suggest that the systems of Antonelli are capable of imaging patterned features on a wafer. Moreover, the prior art does not provide motivation for using the systems of Antonelli to image patterned features on a wafer since the prior art provides no reasonable expectation of success in doing so.

Furthermore, none of the remaining cited art, which includes Miura and Eytan, teaches a contact image sensor. The Office Action states that "Miura et al explicitly claims that the inspection system of that patent can be used to inspect patterned surfaces." (Office Action -- page 3.) However, Miura does not teach that the prior art inspection system is configured as a contact image sensor. As such, Miura does not

teach or suggest that a contact image sensor can be used to inspect patterned surfaces. In addition, Miura teaches using the prior art system to inspect reticles, but not for inspecting wafers. Therefore, Miura does not teach or suggest using the system of Miura to inspect wafers.

The Office Action states that "It would have been obvious to use the image obtaining systems such as shown by Morioka et al, Miura et al and Antonelli et al to obtain the images of patterned wafers for the sort of inspection shown by Yonezawa because it is a known manner of obtaining such images." (Office Action -- page 3.) However, Yonezawa states that "the light emitted from the illuminant 11 is converted to substantially parallel rays of light by the lens 12, and projected onto the substantially entire area of the wafer 8 at an acute angle." (Yonezawa -- col. 6, lines 54-57.) Yonezawa also states that "an image of the substantially entire surface of the wafer 8 is formed on the imaging surface of the CCD camera 21." (Yonezawa -- col. 7, lines 8-10.) Therefore, Yonezawa teaches simultaneously imaging an entire wafer. In contrast, the systems of Morioka, Miura, and Antonelli can image only a portion of a specimen at one time. As such, the systems of Morioka, Miura, and Antonelli obtain images in a different manner than the system taught by Yonezawa. It follows, therefore, according to the logic used above insofar as it is understood, that since the images are obtained in different manners, it would not have been obvious to use the systems of Morioka, Miura, and Antonelli to obtain images for the sort of inspection shown by Yonezawa.

Therefore, the cited art does not teach or suggest a contact image sensor configured to acquire images of repeatable pattern features on a wafer without contacting the wafer, as recited in claims 1, 41, 81, 82, 86-88, 109, 114, and 118. In particular, the combination of Yonezawa, Morioka, Miura, Eytan, and Antonelli does not teach, suggest, or provide motivation for a contact image sensor configured to acquire images of repeatable pattern features on a wafer without contacting the wafer, as recited in claims 1, 41, 81, 82, 86-88, 109, 114, and 118. Consequently, the cited art does not teach, suggest, or provide motivation for all limitations of claims 1, 41, 81, 82, 86-88, 109, 114, and 118.

A *prima facie* case of obviousness has not been established. For example, for at least the reasons set forth above, there is no suggestion or motivation, in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references as suggested in the Office Action. In addition, for at least the reasons set forth above, the prior art does not suggest to one of ordinary skill in the art to expect a reasonable expectation of success for modifying the references as suggested in the Office Action. Moreover, none of the prior art references teach or suggest all claim

limitations as set forth in detail above. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP 2142.

For at least the reasons set forth above, claims 1, 41, 81, 82, 86-88, 109, 114, and 118 are patentably distinct over the cited art. Therefore, claims dependent therefrom are also patentably distinct over the cited art for at least the same reasons. Accordingly, removal of the § 103(a) rejections of claims 1-11, 13-41, 81-114, and 116-119 is respectfully requested.

Information Disclosure Statement:

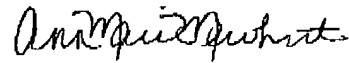
The Office Action states that "On the information disclosure form filed 6 May 2004, cite number 44 has not been considered and has been lined through because the patent number and the listed inventor do not match and it is unclear what the correct cite is intended to be." (Office Action -- page 6.) The Examiner's careful consideration of the Information Disclosure Statement and the references cited therein is greatly appreciated. Applicants have resubmitted under separate paper the reference indicated by citation 44 with the corrected patent number for consideration by the Examiner.

CONCLUSION

This response constitutes a complete response to the issues raised in the Office Action mailed June 29, 2004. In view of remarks traversing rejections, Applicants assert that pending claims 1-11, 13-41, 81-114, and 116-119 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned earnestly requests a telephone conference.

The Commissioner is authorized to charge the required fee or credit any overpayment to Conley, Rose, P.C. Deposit Account No. 03-2769/5589-02701.

Respectfully submitted,



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